



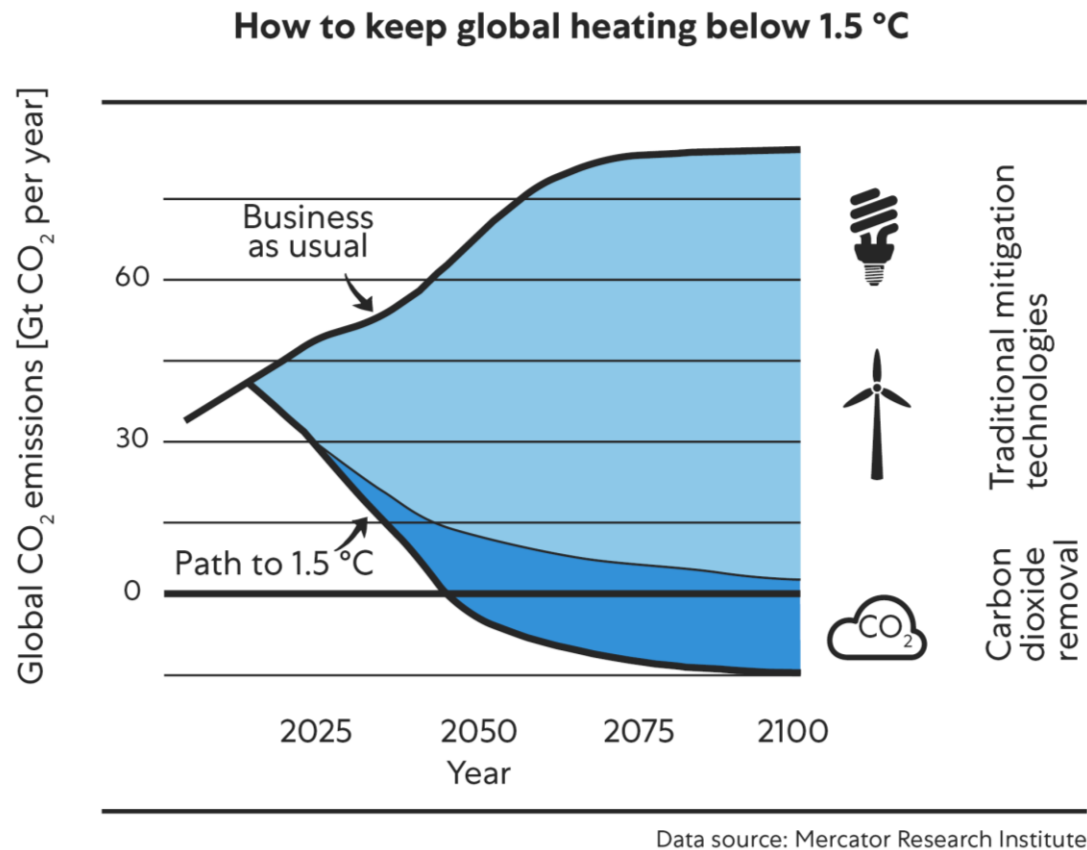
DAC Update

**DoE – Carbon Capture
Project Review Meeting
Oct 7th 2020**

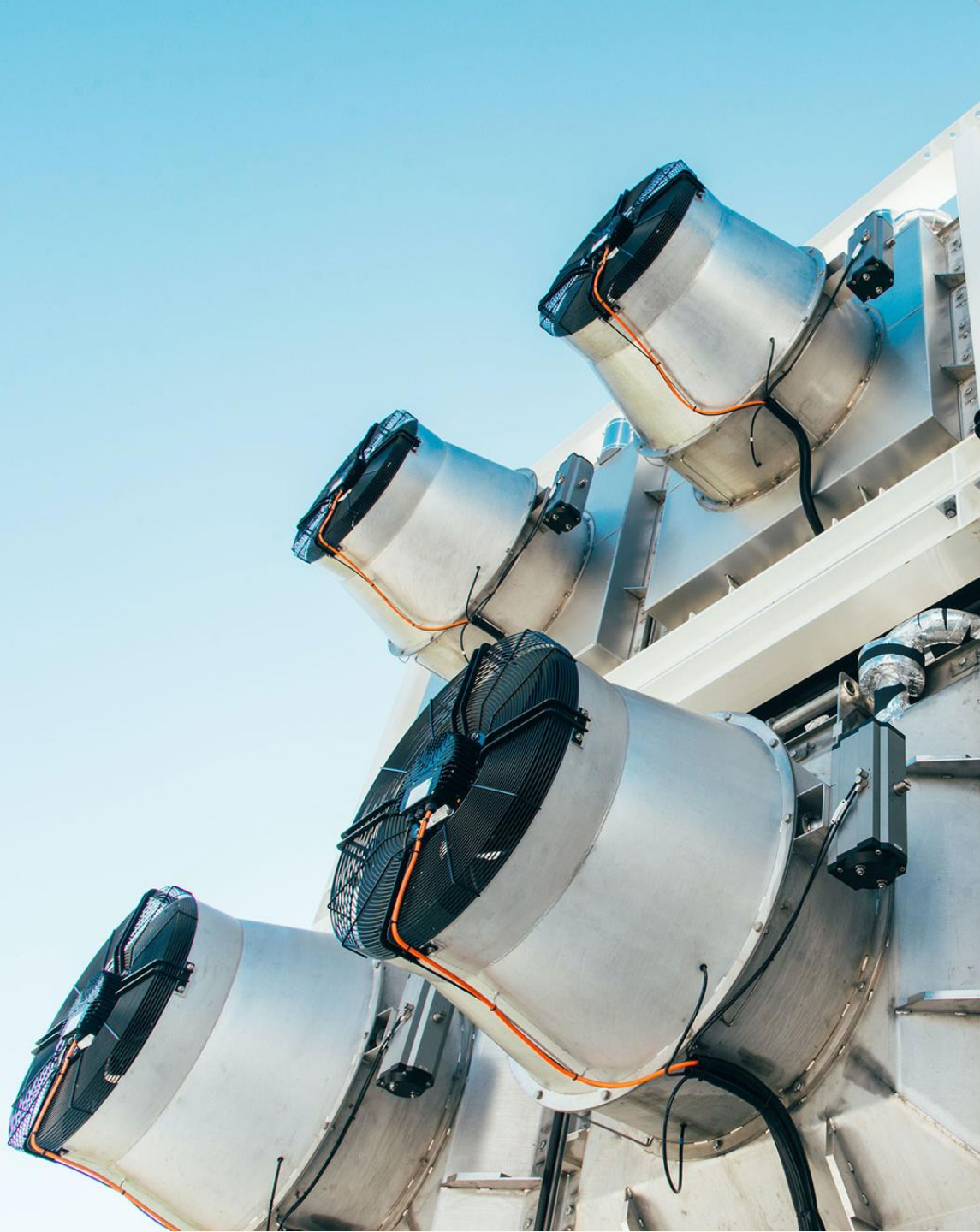
Christoph Beuttler, CDR Manager



Why direct air capture



- Target **unavoidable emissions** to reach net-zero
- Realize **negative emissions** to achieve climate targets



Our solution

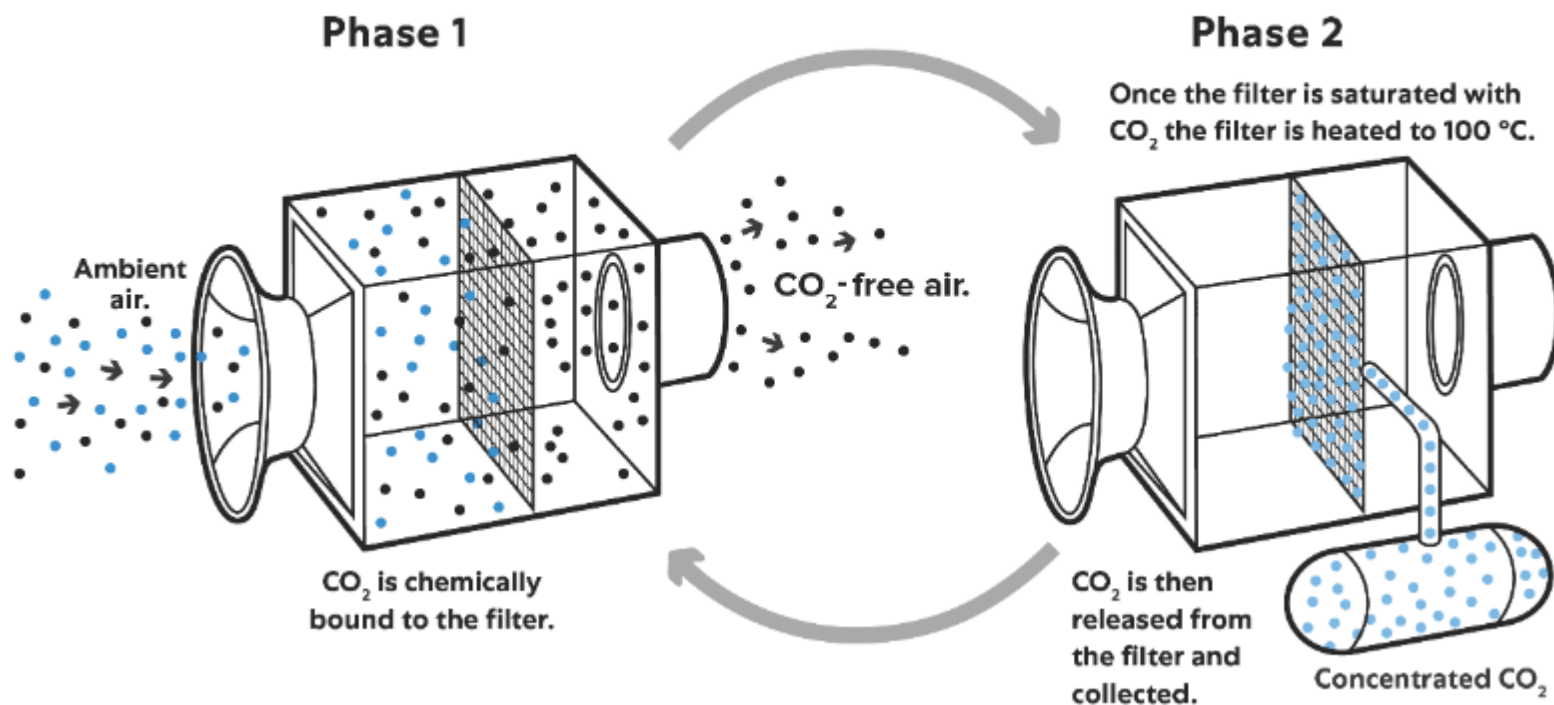


- **Modular** CO₂ collector scale-up via mass production
- **Sustainable energy** as main energy source
- **Low carbon footprint** with 5%-10% life cycle emissions
- **World's first** company supplying DAC solutions to customers

How our technology works



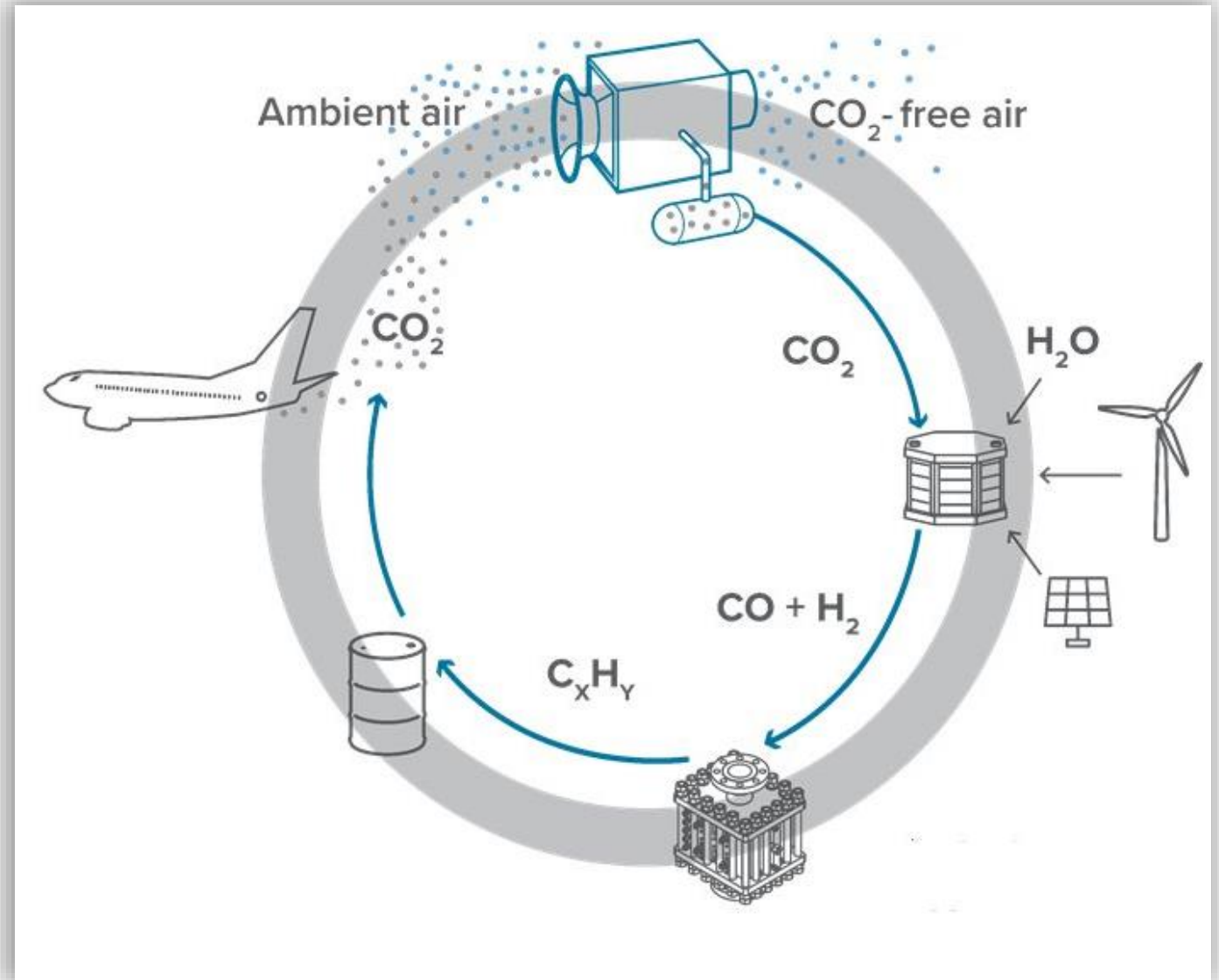
How our technology works



Fuels from air: Closing the carbon cycle



- **Direct Air Capture (DAC):**
Captures CO_2 from ambient air
- **DAC** allows for near carbon neutral e-fuel production
- **No change in infrastructure needed** – closing the gap in renewable fuels



Scalability and land requirement



Surface area needed to meet the 2010 EU transportation energy demand (17,000 pJ/year)

Corn Biofuel

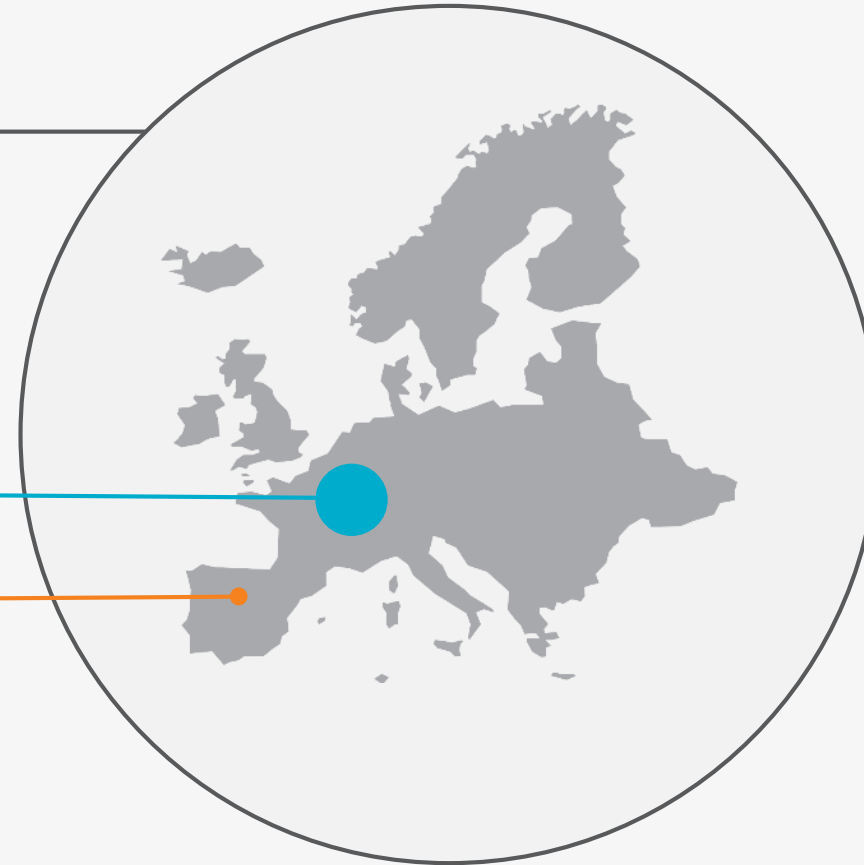
28'000'000 km²
of arable land
(yield assumption 18
g/ac/y)

Algae Biofuel

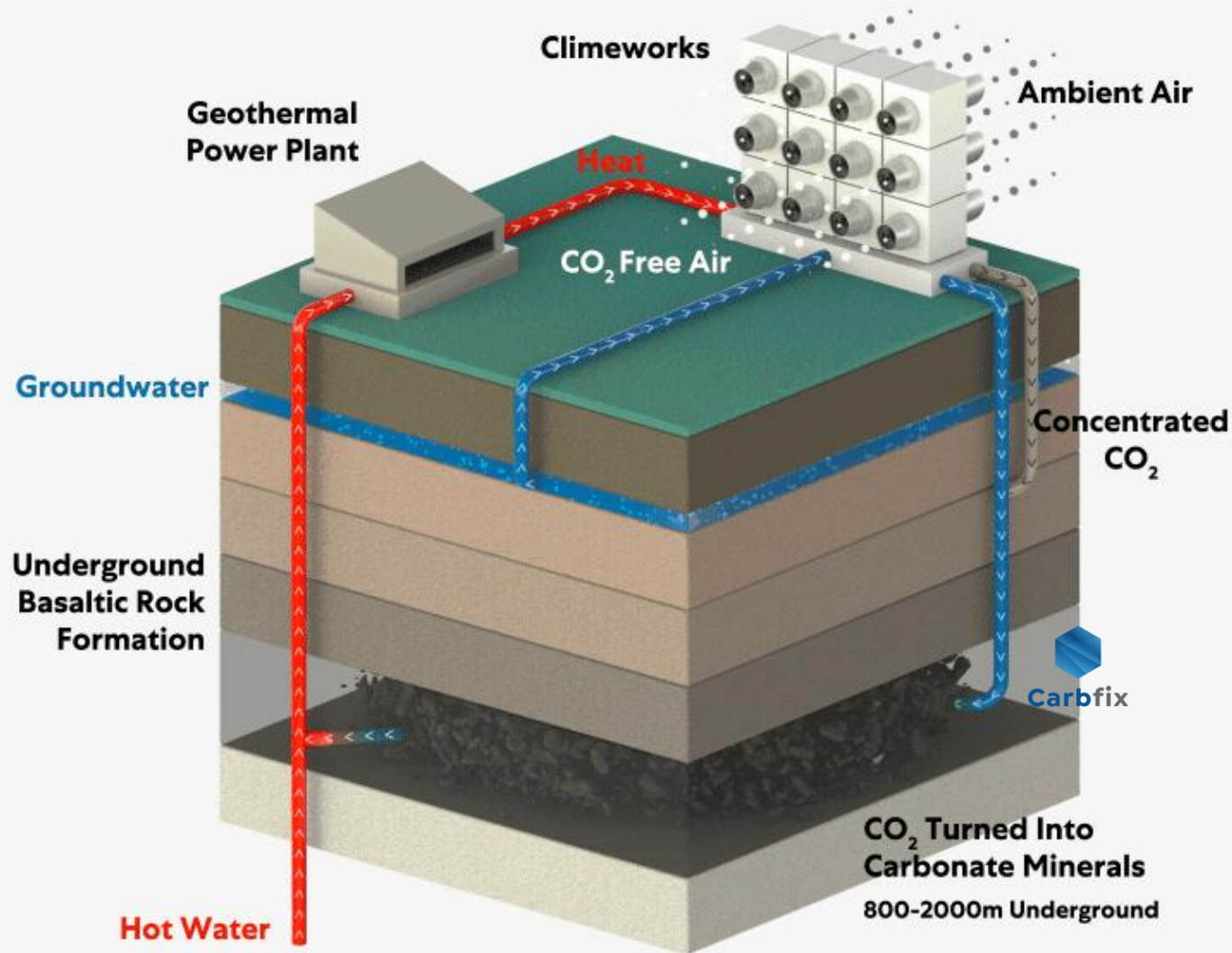
200'000 km²
of barren land
(yield assumption 2'500
g/ac/y)

Renewable Synfuels

14'200 km²
of barren land
(assumption: 1'900kWh/m²,
 $\eta_{PV} = 25\%$, $\eta_{PtX} = 70\%$)



Carbon dioxide removal via direct air capture



“Orca” plant, Iceland, 2020



- New, optimized CO₂ collector design
- Nominal capacity 4'000 tons of CO₂/y
- Investment > USD 10m
- Location: Geothermal park at Hellisheiði power plant, Iceland



- Heat and electricity supply through geothermal power plant
- CO₂ storage & mineralization in collaboration with Carbfix (suitability of basaltic reservoir for permanent carbon mineralization demonstrated since 2012)



- CDR services sold to private and corporate customers
- Start of regular operation: Q1 2021
- Expected commercial lifetime: 10 years

Comparison of CO₂ removal approaches



AFFORESTATION

Large-scale tree plantations to increase carbon storage in biomass.



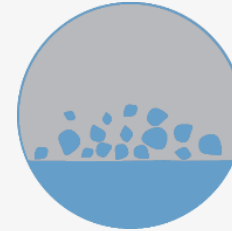
BECCS

Bioenergy in combination with carbon capture and storage.



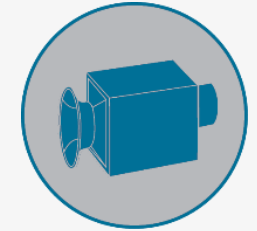
ENHANCED WEATHERING

Distribution of crushed silicate rocks on soil surface to absorb CO₂ chemically.



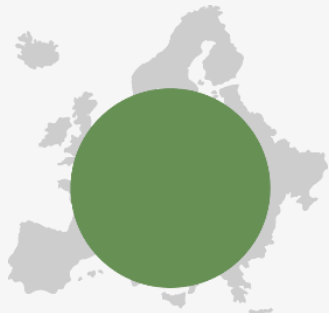
DIRECT AIR CAPTURE

Direct capture of CO₂ from ambient air through engineered chemical reactions.



AREA REQUIRED

to remove 8 Gt CO₂ per year



Scale-up roadmap



 **Iceland**
Hellisheiði

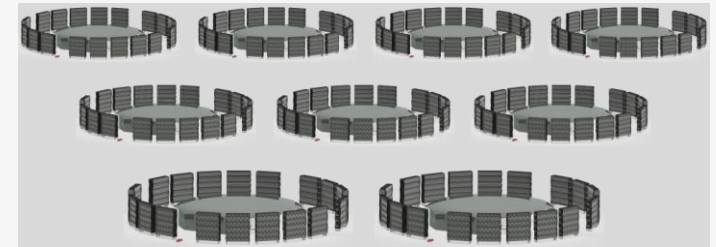


4 kt/year

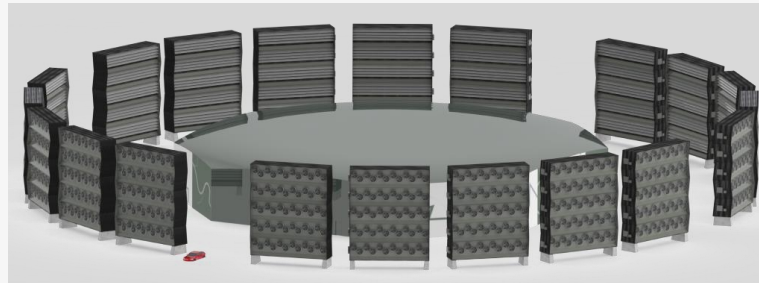
 **Switzerland**
Hinwil



1 kt/year



> 500 kt/year



> 50 kt/year

Phase

Create market

Enable scale-up

Volume production

Global roll-out

Year

2017

2020

≈ 2023

≈ 2025

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